

DESCRIPTIONProgram-controlled domestic appliance

5 [001] The invention relates to a program-controlled domestic appliance, especially a cooker, washing machine or drier provided with a charging opening which is arranged in the front side of its housing and which can be sealed by means of a door, and a door handle preferably fixed to a door frame or a handle area integrated into a door frame by which means the door can be moved with the hand, as well as a visual display for the closure state of the door and  
10 controllable illumination means internal to said device to characterize operating states.

[002] Program-controlled electric domestic appliances such as cookers, washing machines and driers provided with a front opening to the working chamber by which means to domestic appliance is loaded and unloaded with food, laundry or similar, must be sealed by means of a  
15 door to ensure perturbation-free operation during the program sequence so as to eliminate any escape or entrance of heat and/or moisture. Such a door is actuated by hand for which purpose it usually has, for example, a handle located opposite the hinge or a handle area which is usually identifiably raised from other areas as a result of its special shaping. Without wishing to restrict the subject matter of the invention, the term door handle is used exclusively for the  
20 handle element provided for movement of the door by the user.

[003] The state of closure of the door which seals the working chamber is usually sensed and an evaluation is made by the appliance internal control system. The signal indicating the state of closure of the door can be brought about by a purely mechanical coupling to the door lock.  
25 If the charging door is not correctly closed, starting the program is automatically blocked. The fault which has occurred is usually indicated to the user by an audible or a visual signal or by a combination of audible and visual signals. The signals are usually configured such that their meaning as an error or warning message is obtained from themselves. A whistling sound which gets louder or quieter or a periodic flashing of an illuminating means, for example, are usual. If a plurality of such luminous displays are provided, for example on a washing  
30 machine for correct closure of the door, for disturbances in the water intake or in the event of

a leak, the individual displays must be identified by lettering for example so that the user can easily determine the cause of the fault from the fault signal.

[004] These fault messages and their cause determined inside the appliance are increasingly

5 delivered by means of a plain text display. This type of convenient output of information is clear for the user and misinterpretations of the output signals are eliminated.

Disadvantageously however, the plain text on the display can only be read out when the user stays in the immediate vicinity of the domestic appliance and concentrates on the text output to a certain degree.

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[005] In commercially available domestic appliances, it is known to display the state of closure of the door by means of an illuminating means located in the immediate vicinity of the door handle. As a result of this spatial proximity of fault display and cause of fault, the user can correctly interpret the fault signal even without a clear text output. In addition, this type of visual signal output has the advantage that this, and therefore the underlying signal information, can be received by the user and correctly interpreted from a fairly large distance. A disadvantage with this type of signal output is that its content is restricted to a single display.

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[006] It is the object of the invention to improve the perceptibility of optical signals delivered by a domestic appliance and to facilitate interpretation of their content by a user with regard to the closure situation of the door.

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[007] In order to achieve the object, the door handle is used for signal output whereby the door handle is provided with at least one illuminating means or is connected optically to at least one illuminating means so that its light can be emitted forwards from the door handle or from the handle area.

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[008] In one embodiment of the invention the illuminating means is or are light-emitting diodes which can be covered on the outside with an optically transparent shell which scatters the light emitted by the illuminating means such that the door handle emits as a surface. A user can easily perceive the flat illuminated door handle even at a fairly large distance, almost

in passing. For example, a red illumination of the door handle when the door is not correctly locked can easily be identified from a fairly large distance as a signal and as a message for the incorrect state of closure of the charging opening of the domestic appliance and thus as a cause for stopping an appliance.

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[009] In a further embodiment of the invention, differently coloured illuminating means are integrated in the door handle and the individual illuminating means can be controlled with regard to their light emission. A signal with increasing and decreasing luminous intensity brings about a high degree of attentiveness. In a preferred signal output the luminous intensity of the individual illuminating means is controlled with a time delay so as to produce an apparently continuous signal. As a result of the possibility of being able to produce different luminous signals which can be clearly distinguished from one another and on account of the very large area of the door handle configured according to the invention compared to other signal emitters, this is very well suited for emitting signals to characterise operating states, especially signals directly or indirectly related to the state of closure of the door.

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[010] For example, in driers and cookers opening the domestic appliance immediately after the end of the program is not without danger, or is at least unpleasant, because of the high temperatures still prevailing in the interior of the appliance. The door handle configured according to the invention can be used to indicate the drop in the interior temperature by, for example, a red light of different intensity and/or by a flashing light of different switching sequence. A very bright light and/or flashing in quick succession indicates high interior temperatures and therefore danger. As the interior temperature decreases, the luminous intensity and/or the frequency of the flashing sequence decrease. The illuminating means are switched off when the temperature reaches non-critical values. A dark door handle indicates to the user that the charging opening can be safely opened.

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[011] A visual signal output configured according to the invention without specific output of temperature values is sufficiently accurate for practical handling of the domestic appliance.

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Compared with a temperature display, the indication according to the invention additionally has the advantage that the user need not stand directly in front of the domestic appliance to perceive the signal in order to read off the temperature.

[012] A plurality of different optical signals can be produced by using the invention, and these can be perceived from a fairly large distance and their information content is disclosed to the user even with reduced attentiveness. By using the signal output according to the invention, it  
5 is simpler and more convenient for the user to handle the domestic appliance.

[013] The invention as well as further possible embodiments and advantageous applications are explained in detail hereinafter for the example of a washing machine with reference to the appended drawings. In the figures

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[014] Fig. 1 is a front view of a washing machine with a front charging opening and

[015] Fig. 2 is a perpendicular section through a handle area with windows for light signals to pass through from illuminating means inside the appliance.

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[016] The drawing shows a front-loading washing machine provided with a housing 2 and a control panel 1 located in the upper front area, the usual control and display elements 3, 4 being arranged thereon. Access to the interior of the washing drum for receiving the laundry, which is not shown, is made via the vertical charging opening in the housing 2 which can be sealed by a door 5. In the example, the door consists of a door frame 6 with a dished glass insert and is hinged to the appliance housing 2 by means of a hinge 8. Located opposite to the hinge 8 is the door handle 7 which is fitted with a plurality of illuminating means 9 according to the invention and thus serves as a signal emitter. The drawing does not show the locking mechanism of the door and the lever connected to the door handle 7 for unlocking the door,  
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[017] The door handle 7 provided with receptacles for the light-emitting diodes (LEDs) 9 is an integral component of the door frame 6. The function as a handle element is obtained from the special shaping of the door handle 7, its arc-shaped expansion towards the middle of the door and its outward curvature which cannot be seen from the drawing. The front surface of the door handle 7, also not visible, is covered with a shell-like part made of light-permeable material.  
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[018] The red and green emitting illuminating means 9 are disposed in the door handle 7 in a closed arc. The light emitted forwards by the LEDs 9 is diffusely scattered by the transparent cover plate. The arrangement of the LEDs 9 in conjunction with the light-diffusing cover of the light-emitting elements 9 brings about a surface illumination of the door handle 7. The

5       LEDs 9 are individually controllable and their luminous intensity is also variable. The display in the door handle 7 is controlled in a known fashion by means of the appliance internal control system by evaluating the sensing of the closure state of the door and possibly the operating states during a program sequence.

10      [019] Advantageously only a few, easily-interpreted luminous signals are emitted via the door handle 7. When a washing machine is ready for operation, all red LEDs 9 light up if the door is not correctly closed. Other faults can be displayed by red flashing lights. These faults can, for example, be operating disturbances in the water supply and removal.

15      [020] The sectional view shown in Fig. 2 shows a part of a handle area in the frame 6 of the door 5 in detail. In this part a window 11 is arranged in the handle area which, when the door 5 is closed, is positioned directly in front of a light outlet window of an illuminating means 12. e.g. an LED, mounted in the housing wall 2. The light from the illuminating means shines through the window 11 from the back onto a transparent to opaque cover 10 applied to the 20 front of the frame 6 in the handle area, illuminating an area extending over the profile of the window 11 within the extent of its diffusivity. A plurality of such arrangements of illuminating means can be provided in the handle area so that any luminous pattern can thus be produced.

25      [021] Furthermore, a perturbation-free sequence of a washing program can be indicated by the signal device according to the invention on the door handle 7 or in the handle area with a suitable arrangement of illuminating means. Such a visual signal is desirable because otherwise it is difficult for the user to identify that the washing machine is operating. Modern washing machines run with very little noise and the rotation of the drum is barely perceptible 30 under unfavourable light conditions. For example, the illuminating means being switched on continuously can symbolise fault-free operation because this can appropriately indicate a revolving laundry drum as a slowing revolving green circle of light.